significant features of the high-dimensional model, they are only subspaces that provide an insufficient basis for models of visual stimulus representation in ventral temporal visual cortex.

SYSTEMS FOR CATEGORY-SELECTIVE PROCESSING IN THE MACAQUE

Doris Tsao, CalTech

fMRI studies in the mid and late 1990s described an area in the human brain that showed strongly increased blood flow in functional magnetic resonance imaging (fMRI) experiments when people viewed pictures of faces compared to pictures of objects (1). This seemed to offer an ideal potential preparation for tackling the problem of how the brain extracts global visual form: a small piece of brain specialized to encode a single visual form. Thus, 12 years ago, Winrich Freiwald and I began a journey into exploring the neural basis of face processing. We decided to look for a face-selective area in macaque monkeys, reasoning that it would not be unreasonable to find such a region in monkeys, since face recognition is also integral to macaques—and most importantly, if we did find such a region, then we could target an electrode to the region (something not possible in humans) and directly record from individual neurons to ask how they are encoding faces. In my talk, I will discuss the anatomical and functional organization of the macaque face processing system, as well as the more recently discovered macaque scene processing system. How are regions within these two systems system connected to each other and the rest of the brain? What representations are used in face and scene-selective regions? What is the contribution of different regions to behavior? What information is communicated between regions?

TMS EVIDENCE FOR CATEGORY-SELECTIVE CORTICAL REGIONS IN HUMAN EXTRASTRIATE CORTEX

David Pitcher, Brain and Cognition, National Institute of Mental Health

Neuropsychological patients exhibiting category-selective visual agnosias have provided unique insights into the cognitive functions of the human brain but such case studies are exceptionally rare. To overcome the paucity of patients exhibiting category-selective deficits I have been using transcranial magnetic stimulation (TMS) to transiently disrupt face, object and human body perception in neurologically normal experimental subjects. Results support a modular account of cortical organization in which category-selective brain regions contribute solely to discrimination of their preferred category. Follow-up studies, that exploited the temporal precision of TMS, reveal the temporal dynamics underlying visual object perception in human occipitotemporal cortex.

HUMAN VISUAL NUMERAL AREA

Josef Parvizi, Stanford University

Is there an area within the human visual system that has a preferential response to numerals as there are for faces, words, and scenes? We addressed this question using intracranial electrophysiological recordings and observed significantly higher response in the high-frequency broadband range to visually presented numerals, compared to orthographically similar (i.e., letters and false fonts) or semantically and phonologically similar stimuli (i.e., number-words and non-number words). This preferential response had anatomically consistent location in the inferior temporal gyrus (ITG) and anterior to the temporo-occipital incisure. This region lies within or close to the functional magnetic resonance imaging (fMRI) signal-dropout zone caused by the nearby petrous bone and venous sinuses – an observation that explains prior negative findings in the fMRI studies of preferential response to numerals. Since visual numerals are culturally dependent symbols that are only learned through education, our novel finding of anatomically localized preferential response to such symbols provides yet another example of acquired category specific responses in the human visual system.

Invited-Symposium Session 5

NETWORKING ATTENTION

Tuesday, April 16, 10:15 am – 12:00 pm, Grand Ballroom

Chair: Anna Nobre, University of Oxford

Speakers: Michael I Posner, Sabine Kastner, Anna C Nobre, Earl K Miller.

Attention is a core aspect of our mental life, at the centre stage of cognitive neuroscience. This symposium brings together scientists working with different methods and at different levels of analysis to provide a contemporary view of the scope and properties of attention-related functions, and the mechanisms that make our cognition selective, flexible and adaptive.

ATTENTION NETWORKS PAST AND FUTURE

Michael I Posner, University of Oregon

Fifty years ago it was sufficient to show that attention changed certain operations in the information-processing stream between stimulus and response. Twenty years ago it became possible to implicate specific brain areas. Today papers examine putative brain networks that carry out some of the functions ascribed to attention and trace their activation and synchrony in real time. These networks are present in infancy but a long developmental process involving changes in connectivity is required to reach their adult state. Individual children and adults differ in the efficiency of attention networks in part due to different genetic polymorphisms that operate in interaction with environmental influences. The efficiency of attention networks can be improved by practice, and by changing the brain state in which they operate. Looking to the future, we should be able to foster the development of these networks, locate aspects that may be deficient in certain people and test methods designed to improve or eliminate the deficiencies.